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# Graphene Alliance for Sustainable Multifunctional Materials to Tackle Environmental Challenges

GRAPHENE  
FLAGSHIP

UKRI  
UK Research  
and Innovation



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**GIANCE**  
Fused with Sustainability





# PROJECT

GIANCE presents creative solutions to environmental challenges by establishing a comprehensive and industry-driven platform. This platform aims to design, develop, and produce the next generation of affordable, eco-friendly, lightweight, and recyclable materials based on graphene and related substances (GRM). These materials include multifunctional composites, coatings, foams, and membranes (GRM-bM) with enhanced properties, such as thermal, mechanical, and chemical features.

These innovations also improve functionalities like wear resistance, corrosion resistance, chemical and fire resistance, hardness, impact resistance, high-temperature resistance, and structural health monitoring. Additionally, GIANCE focuses on enabling hydrogen storage. The project strives to advance manufacturing processes, enhance synthesis and stability, and minimize environmental impact.

The GRM-bM and manufacturing capabilities developed by GIANCE will foster strong connections with end-users, enabling the qualification and development of commercial propositions to high Technology Readiness Levels (TRLs). GIANCE aims to demonstrate and validate the effectiveness of GRM-enabled products through 11 use cases, influencing future technologies across various sectors, including automotive, aerospace, energy (hydrogen economy), and water treatment.

# OBJECTIVE

-  Develop and Validate Highly Innovative and Sustainable Materials for New Scalable Use Cases (UCs)
-  Develop and Optimize Sustainable Manufacturing Technologies
-  Implement Life-Cycle Assessment (LCA), Life-Cycle Cost (LCC), and End-of-Life (EOL) Strategies
-  Accelerate Innovation and Contribute to the Governance and Coordination of the Graphene Flagship (GF) Initiative

# IMPACTS

GIANCE's Revolutionary Materials Solutions project pioneers novel, scalable GRM-bM materials, boosting eco-designed manufacturing processes. This positions the EU as a global GRM-bM leader, fostering innovation and competitiveness. Embracing a circular economy, the project enhances recyclability, achieves significant weight reduction in automotive applications, and improves multifunctional performance. Innovations in manufacturing, strategic autonomy, and competitiveness are bolstered, while a sustainable supply chain is prioritized. With up to 30% improved environmental performance, the project aligns with the EU Circular Economy Action Plan, fortifying European resilience and leadership in the green and digital revolution.

- Develops revolutionary Materials Solutions
- Elevates EU Leadership and drives Circular Economy
- Significant Weight Reduction and Energy Efficiency in transport sector
- Optimizes manufacturing processes for resource efficiency
- Achieves up to 30% improvement in environmental performance.
- Accelerates adoption of innovative materials

